

## REMARKS

### I. Introduction

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of January 26, 2009 is respectfully requested.

By this amendment claims 54 and 72 have been amended and claim 55 has been cancelled. Claims 54, 56, and 58-111 are now pending in the application. No new matter has been added by these amendments.

### II. 35 U.S.C. § 112, Written Description Requirement

On page 6 of the Office Action, claims 54-56 and 58-111 are rejected as failing to comply with the written description requirement. In particular, the recitation of “a plurality of rods bundled together and each having 2-12 layers” is asserted as not having support in the specification as originally filed “with the specificity needed to demonstrate possession.”

Amended claim 54 recites, in part: “...wherein each carbon nano-fibrous rod has a central axis and axial end portions, and comprises 2-12 hexagonal carbon layers...” Amended claim 72 recites, in part: “...a carbon nano-fibrous rod comprising 2 to 12 hexagonal carbon layers...”

The fourth paragraph on page 4 of the specification as originally filed provides: “A third invention is the carbon nano-fibrous rod according to the first or second invention, characterized in that 2 to 12 of the hexagonal carbon layers are stacked.” The third full paragraph on page 24 of the specification as originally filed provides: “...2 to 12 of the hexagonal carbon layers 11 are stacked to form one constitutional unit.” Claim 3 of the application as originally filed provides: “The carbon nano-fibrous rod according to claim 1 or 2, characterized in that 2 to 12 of the

hexagonal carbon layers are stacked.” Claim 7 of the application as originally filed provides: “... between the carbon nano-fibrous rod comprising the 2 to 12 of the hexagonal carbon layers stacked...”

Accordingly, Applicants submit that the “2-12 hexagonal carbon layers” limitation recited in the claims is supported by the specification as originally filed at least at pages 4 and 24 and claims 3 and 7. Withdrawal of this rejection is respectfully requested.

### III. 35 U.S.C. § 112, Enablement Requirement

Beginning on page 6 of the Office Action, claims 54-56 and 58-111 are rejected as failing to comply with the enablement requirement with regard to limitations “limiting each of the ‘rods’ that constitute the aggregate by the number of layers.” The Office Action states “Such information as the interrelationship between catalyst size, temperatures, pressures, flow rates, residence time, etc. is needed.

Referring to the printed publication of the present application, Fujioka et al. US 2006/0057054, such variables are detailed in at least paragraphs 0151 (pressure and temperature), 0154 (reaction time, temperature, flow rate), 0160 (catalyst composition), 0161 (temperature, pressure, flow rate, reaction time), 0168, 0170, 0171 (temperature), 0179, 0195 (catalyst size), 0198 (carbon material composition), 0205, 0207 (flow velocity), 0209 (temperature and pressure), 0210 (pressure), 0213 (carrier composition), 0215 (catalyst composition), 0216-0217 (binder composition), 0231 (reducing gas), 0245 (flow velocity), and 0251-0279 (reduction time, flow rate, heat treatment time, catalyst composition, temperature, pressure, etc.). Thus Applicants submit that the present invention is described with sufficient specificity to enable one

of ordinary skill in the art to make and use the invention.

The Office Action further states “How do you have a herringbone carbon fiber with ‘layers’...extending in only one direction.” Applicants could not find a recitation in the claims of “extending in *only* one direction.” Furthermore, figure 11(b) shows a nanocarbon cluster having a herringbone structure. Each individual rod in the cluster faces in a particular direction, thus hexagonal carbon layers composing the individual rod could be arranged “extending in one direction,” as required by claim 54.

The last several sentences of the enablement rejection appear to be general questions regarding the subject matter of the application. Applicants are unaware of how a question such as “is it really proper to call it a ‘rod?’” could form the basis of an enablement rejection. The standard for determining whether an application satisfies the enablement requirement is whether the specification describes the invention in such terms that one skilled in the art can make and use the claimed invention. Applicants submit that the 51 figures and 87 page specification, which includes detailed examples with quantification of numerous variables as discussed above, is sufficient to enable one of ordinary skill in the art to make and use the claimed invention.

#### IV. 35 U.S.C. § 112, Indefiniteness

On page 7 of the Office Action claims 54-56 and 58-111 are rejected as being indefinite for including the allegedly unclear limitation “2-12 hexagonal carbon layers extending in one direction.” In particular, the Office Action states “It is not understood whether applicants mean layers or platelets, and if they mean both, whether various dependent claims reciting dimensions or morphologies even make sense.”

Applicants submit that the unambiguous language “2-12 hexagonal carbon layers” clearly establishes that Applicants are claiming layers. With respect to morphologies, the herringbone structure is explained above. Accordingly, Applicants submit that claims 54-56 and 58-111 are sufficiently definite, and thus withdrawal of this rejection is respectfully requested.

V. 35 U.S.C. § 112, Other

Beginning on page 7 of the Office Action, claims 54-56 and 58-111 are rejected for failing to set forth the subject matter which Applicants regard as their invention. The Office Action appears to reject the claims on the basis that the response of October 23, 2008 makes a statement which contradicts the claims.

As discussed above, the claims are unambiguous; the subject matter which Applicants regard as their invention is established by the plain meaning of the claims. Applicants are unaware of any precedent which supports rejecting claims based on a statement in a response which is alleged to be being contradictory to the claims. Applicants submit that if a statement in a response were construed to be contradictory to the claim language or if the statement argued a limitation which is not recited in the claims, such a statement would *merely be unpersuasive*; it would not be grounds for rejecting the claims. As there appears to be no precedent for such a rejection, Applicants are unaware of how to overcome the rejection aside from stating that the subject matter which Applicants regard as their invention is defined by the claims.

Moreover, the portion of the response of October 23, 2008 which the Examiner references does not contradict the claims or in any way evidence that the claims do not represent what Applicants regard as their invention because that portion of the response quotes the claim

language verbatim. It is unclear how any statement which directly quotes claim language as the basis for differentiating the invention from the prior art could be taken as evidence that Applicants regard the invention to be something other than what is claimed.

Further, the response does not assert, as stated in the Office Action, that the application does not deal with carbon nanotubes. To the contrary, the portion of the response which is referenced in the Office Action differentiates multilayered *concentric* tubes and *single walled* tubes from a rod comprising *hexagonal carbon layers*. Applicants could not find any portion of the response which could properly be taken as stating or implying that the application does not involve carbon nanotubes.

Applicants respectfully request withdrawal of this rejection.

## VI. Prior Art Rejections

Currently, claims 54-71 stand rejected under 35 U.S.C. § 102(b) as being unpatentable over Rodriguez (NPL 1995) and claims 54-72, 74-76, 78-88, 90-99, and 101-111 stand rejected under 35 U.S.C. § 102(b) as being unpatentable over Resasco et al. (US 6,413,487). Claims 73, 82, 100, and 106 are rejected under 35 U.S.C. § 3(a) as being unpatentable over Resasco et al. in view of six other references: Baker et al. (US 5,618,875), Smalley et al. (US 7,052,668), Dai et al. (NPL 1996), Choi et al. (NPL 2000), Willems et al. (NPL 2000), and Kaatz et al. (NPL 2003). Claims 77, 104, 94-99, and 110 are rejected 35 U.S.C. § 102(b) as being unpatentable over Resasco et al.

Claim 54 is patentable over Rodriguez, Resasco et al, and the remainder of the prior art listed above, whether taken alone or in combination, for the following reasons. Claim 54

requires a fibrous nanocarbon comprising a plurality of carbon nano-fibrous rods gathered together, wherein each carbon nano-fibrous rod has a central axis and axial end portions, and comprises 2-12 hexagonal carbon layers extending in one direction.

Similarly, claim 72 requires a method for producing fibrous nanocarbon comprising an aggregate of carbon nano-fibrous rods, the method comprising, in part, performing a carbon material supply step of supplying the carbon material in a gaseous state to produce a carbon nano-fibrous rod comprising 2 to 12 hexagonal carbon layers extending in one direction, in a presence of the metal catalyst of the dual-purpose catalyst/fluid material.

Page 8 of the Office Action of January 26, 2009 states: "Notwithstanding all the ambiguities over what is a layer or a platelet...it is expected that this limitation is taught or obvious over Rodriguez and Resasco." Similarly, page 5 of the Office Action of June 23, 2008 states: "Given that the process is taught (reactor, catalyst, feed source, etc.) is taught, it is expected that all products are taught. This is the evidence offered to show inherency."

"[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385,1396 (2007); See also MPEP 2143.01. "To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." MPEP 2112 (emphasis added); see also *In re Robertson*, 169 F.3d 743, 745, (Fed. Cir. 1999).

With respect to inherency, no *evidence* has been provided which shows that 2 to 12 hexagonal carbon layers would be inherent in the carbon structures of Rodriguez or Resasco. The statement that “it is expected” that the limitations would be present in the prior art is not evidence relating to carbon nano-fibrous rods; it is merely a statement of the Examiner’s belief. Such a conclusory statement does not make it clear that the configuration claimed is necessarily present in the prior art; as such, it cannot support an anticipation rejection under the doctrine of inherency.

The Office Action does not cite any portion of the prior art which discloses the claimed configuration of 2 to 12 hexagonal carbon layers, provides no evidence to show that such a configuration is inherent in the disclosures of the prior art, and makes no assertion that it would be obvious to modify any of the prior art to have the claimed configuration. Thus, the Office Action does not establish the anticipation of claims 54 and 72, and also fails to establish a *prima facie* case of obviousness with regard to claims 54 and 72.

As discussed above, Applicants disagree with the rejections contained in the Office Action. However, in an effort to advance prosecution, further limitations have been added to claims 54 and 72. These limitations are also not disclosed or rendered obvious by the prior art.

In particular, claim 54 has been amended to require a fibrous nanocarbon comprising a plurality of carbon nano-fibrous rods gathered together, wherein each carbon nano-fibrous rod has a central axis and axial end portions, and comprises 2-12 hexagonal carbon layers extending in one direction, and wherein said hexagonal carbon layers have an axial width (D) of  $2.5 \pm 0.5$  nm, and a length (L) of  $17 \pm 0.5$  nm, and wherein said plurality of carbon nano-fibrous rods are stacked in a stacking direction and the length of each of the hexagonal carbon layers is larger

than a dimension of the stacked hexagonal carbon layers, the dimension being in the stacking direction of the hexagonal carbon layers.

The Rodriguez reference relates to the production of carbon nanofibers, with representations of the carbon nanofibers being shown in Figures 1c, 2c, and 3c. As seen in those figures, the length of each hexagonal carbon layer is smaller, *not larger*, than the dimension of the hexagonal carbon layers in the stacking direction. Because Rodriguez does not disclose a plurality of carbon nano-fibrous rods stacked in a stacking direction and a length of each of the hexagonal carbon layers is larger than a dimension of the stacked hexagonal carbon layers, the dimension being in the stacking direction of the hexagonal carbon layers, Rodriguez cannot meet the requirements of claim 54. Further, Rodriguez fails to disclose the axial width and length dimensions required by claim 54; as such, Rodriguez cannot meet the requirements of claim 54. The figures of the Resasco reference do not show the structure of any carbon nanofibers, and no portion of the specification could be found which discloses the limitations discussed above. As such, Resasco cannot meet the requirements of claim 54.

Claims 72 has been amended to require a method for producing fibrous nanocarbon comprising an aggregate of carbon nano-fibrous rods including, in part, a second gas supply step of supplying a carbon-free inert gas and heating the dual-purpose catalyst/fluid material by a heating means to a higher temperature than a reaction temperature for reaction between the dual-purpose catalyst/fluid material and the carbon material, so as to eliminate a fluidizing function of the dual-purpose catalyst/fluid material; wherein said hexagonal carbon layers each have an axial width (D) of  $2.5 \pm 0.5$  nm, and a length (L) of  $17 \pm 15$  nm, and wherein said plurality of carbon nano-fibrous rods are stacked in a stacking direction and the length of each of the hexagonal

carbon layers is larger than a dimension of the stacked hexagonal carbon layers, the dimension being in the stacking direction of the hexagonal carbon layers.

Because claim 72 also requires the axial width and length dimensions which are discussed above with respect to claim 54, and also requires the length of each hexagonal carbon layer to be larger than a dimension of the hexagonal carbon layers in the stacking direction, the arguments set forth above with respect to claim 54 also support the patentability of claim 72.

Claim 72 further requires supplying a carbon-free inert gas and heating the dual-purpose catalyst/fluid material by a heating means to a higher temperature than a reaction temperature for reaction between the dual-purpose catalyst/fluid material and the carbon material. Because neither Rodriguez or Resasco disclose heating the dual-purpose catalyst/fluid material to a higher temperature than the reaction temperature, and thus, neither Rodriguez nor Resasco can meet the requirements of claim 72.

It is thus submitted that the invention of the present application, as defined in claims 54 and 72, is not anticipated nor rendered obvious by the prior art. Allowance is respectfully requested.

Claims 56 and 58-71 depend, directly or indirectly, from claim 54 and are thus allowable for at least the reasons set forth above in support of claim 54. Claims 73-111 depend, directly or indirectly, from claim 72 and are thus allowable for at least the reasons set forth above in support of claim 72.

In view of the foregoing amendments and remarks, inasmuch as all of the outstanding issues have been addressed, Applicants respectfully submit that the present application is in complete condition for issuance of a formal Notice of Allowance, and action to such effect is

earnestly solicited.

Should any issues remain after consideration of the within response, however, the Examiner is invited to telephone the undersigned at the Examiner's convenience. If any fee beyond that submitted herewith, or extension of time is required to obtain entry of this Amendment, the undersigned hereby petitions the Commissioner to grant any necessary time extension and authorizes charging Deposit Account 23-0975 for any such fee not submitted herewith.

Respectfully submitted,

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